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VOL. XLVII. MAY, 1936 No. 5

Psocid Habits

By H. ELLIOTT MCCLURE, University of Illinois, Urbana, Illinois.

In 1932 a species of psocid was found in the Palm House of the University of Illinois feeding upon a sooty mold of the genus *Capnodium* growing on the leaflets of a palm, *Areca lutescens*. Specimens sent to Mr. Nathan Banks were determined as *Ectopsocus californicus* Banks, a native of California, having been described by Banks in 1903.

STRUCTURE AND FOOD.

The adult female, a typical psocid form, is nasus brown to cream, two to three millimeters long from front of head to tip of wings. The wings are hyaline, 1.5 to 2 millimeters in length and the antennae are 1.4 millimeters long. The mandibles are heavy, measuring approximately 0.15 millimeters long by 0.13 millimeters wide, with two or three blunt but strong teeth. The abdomen varies in size according to the maturity of the eggs in the ovaries and bears a tiny forked ovipositor or egg guide about 0.13 millimeters long. Under the conditions of the greenhouse, of an incubator, and even of a refrigerator, the insects produced no males in ten generations.

The insects are not generally active, but can run swiftly with an alert, cocky attitude and fly for short distances, six inches, with a quick, ragged flight. They are somewhat negative to light, preferring the undersides of leaves and are positive to smooth surfaces, seeking a smooth surface upon which to lay the eggs even in a bright light.

All stages spin a protective net of fine web above their daytime resting place. This net is not for protection from external enemies, but is to prevent the insects from falling away from the plant with a sudden gust of wind. This is particularly true of the females which upon sudden jarring lose mobility and

fall into the net from which they can extricate themselves upon returning responsiveness. The silk is spun from the mouth.

The labium is large and the labrum extensible so that, in feeding, the mouth parts are protruded around the mandibles which break off bits of the fungus and chew it long and thoroughly. As the food material is black, it can readily be seen in the intestinal tract which forms a large U-shaped curve on the left side of the abdomen. The females when starved will feed upon their own eggs and eat whatever silk has been spun. They regularly eat old egg shells and all stages devour exuviae. They are occasionally cannibalistic and the adults have been seen to attack and devour fungus mites. In one instance a mite 0.1 millimeter ling, in crawling about a gravid female, touched one foot which she moved. Then, as it touched another foot, the psocid whirled and with a flirt of her antennae pounced upon the mite and devoured it avidly.

The sooty mold is a hard, dry, black surface growth on the leaves which, unless moist to a certain consistency, is inedible by the psocids. They live only under very closely balanced conditions of humidity. If the air is too dry, they shrivel and die. If the substratum is too moist, they drown and, if the sooty mold is too dry, they starve. If the air has been dry for a short time and then the leaf is moistened, the insects run to the moisture and drink by applying the extended mouth-parts to it and sucking. The adults and first instar nymphs are most susceptible to drying, while the eggs are the most resistant.

Egg-Laying.

The length of life of all stages varies greatly, depending upon the external conditions. Adult life varies from 15 to 30 days. During this time the female lays consecutively for a period which varies from 9 to 18 days.

The female may begin laying eggs the day she becomes mature or she may wait several days, depending upon the condition of the ovaries and the external conditions. As the eggs in her ovaries mature, the abdomen becomes greatly distended and she is agitated to activity. She runs about, feeding on the mold, or rests at a spot which she has previously selected as satisfactory for her eggs. The chief prerequisite of such a

position is smoothness, although intensity of light may affect the choice slightly on the palm frond. In the rearing vials the eggs are generally laid on the glass.

Shortly before oviposition, long strands of silk are spun as protective guy wires over the location for the eggs. In spinning these the female attaches the silk to the substratum with a rotary motion of her labium and then runs several steps, for about a centimeter, holding her head high and attaches the other end. On the curved surface these taut lines form an open canopy and occasionally the insect stands on her hind four legs and reaches up into the canopy to attach another line. At least a hundred of these strands are laid down. As the time for oviposition draws near, the gravid insect becomes more nervous and irritable. If another female or a nymph approaches, she dashes at the intruder, who retreats. She walks about feeding and biting at anything present, including excrement, and is capable of returning to the same spot after extended wanderings.

At the moment of oviposition the tip of the abdomen is worked in and out, the legs are set well apart and strained. Gradually, after ten or fifteen seconds of working the egg to the vagina, the abdomen becomes quiet and then with a sudden convulsion it forces a large drop of fluid including much waste material from the anus. With this drop hanging upon the tip of the abdomen, the egg is partially forced into it and pressed to the substratum. At half extrusion the insect vibrates its whole body with a convulsion as violent as that of a dog shaking a rat. The body almost rears upon the tip of the abdomen and very little weight is put on the front feet during this movement. As the two little tips or fingers of the ovipositor grasp the egg on the sides and undersurface, they are brought into play during this violent vibration and work the egg out of the body. The motion of the insect during this vibration is so rapid that the body looks blurred, making it impossible to count the movements made in the second required. Without the egg guides releasing their hold on the egg, the fluids that preceded it and flowed over the substratum, having a viscosity slightly less than water, are pumped back into the body by a muscular

action about the cloaca or hind intestine. The rectal material in the liquid is deposited about and covers the egg and the residue from the fluid acts as an adhesive, holding the egg in place.

After the strenuous process of oviposition the female rests about five minutes and then returns to her cruising, biting at this and that, spinning a few guy wires. She is very nervous, scraping the tip of her abdomen on the substratum, quivering and straining. Then, alongside her previous egg, she begins the final stage of pulsing which heralds another.

It takes about ten minutes between eggs, depending upon the maturity of the forthcoming ova and a minute for the actual laying, so that about an hour and a quarter is necessary for the deposition of a group of six.

Spinning Dance.

Almost immediately after the sixth egg is laid, what may be called the spinning dance begins. Fine silk strands are spun back and forth across the eggs to a diameter of about two millimeters, almost the length of the insect. Slowly at first begins the dance as each of the foundation threads is firmly attached at its ends to the substratum by a pressing and rotary motion of the labium. Gradually, after the first few are attached, the dance quickens until the dancer's feet are fairly flashing. She pivots and backs, turns and steps forward, after each movement pressing her lips to the surface until she is laying over ninety strands a minute and the eggs are crossed and recrossed hundreds of times. She never doubles a strand, but always changes her position so that the eggs are finally covered with a blanket of fine white silk extending over them as a canopy and not directly attached to them. This spinning to cover the eggs takes about half an hour, 31 minutes more or less, depending on the female, during which she lays down as many as 2,829 strands of silk. The amount of silk necessary for one group of eggs is 5.5 to 6 meters and as a female is capable of laying 18 groups of eggs she must be able to spin 100 meters or approximately 115 yards of silk. This is remarkable for an insect only 2.5 millimeters long and it does not constitute all the spinning that she does. If all this silk

were woven into a mesh it would make a piece of silk one inch square and a little more than one micron thick, as the strands are about one micron in thickness.

The acts of oviposition are not yet complete. After a rest of a minute or two, the female turns around and, dragging the tip of her abdomen in strokes of about 0.5 millimeters across the silk covering, deposits a liquid from the anus which is probably the same material as that which precedes an egg. The liquid contains bits of food material and is painted on in several strokes after intervals of rest, makng a total of about 100 strokes, requiring ten or fifteen minutes. This granular anal liquid is painted on the mat so as to stick the threads together and make the silk hard and brittle and easy to tear. It does not waterproof the silk nor does it cover the entire surface, but remains in streaks and blotches as the strokes of the female's abdomen left it.

The oviposition of six eggs takes about two hours with the first hour for laying and the second for spinning and painting.

EGGS.

The eggs are ovoid, 0.4 to 0.5 millimeters long by 0.2 to 0.25 millimeters wide and pearly white, semi-transparent, with a smooth unetched chorion. As they ripen the eggs darken from pale cream to yellow with the outlines of the embyro distinguishable.

The common number of eggs to a group is six. Practically never is the number greater, for in more than a thousand groups only two contained seven and none more than seven. A smaller number may be laid, depending upon the age of the female and the condition of her ovaries. Unless the adult is well fed she does not lay at all, while one well-fed female produced 17 groups in 18 days, it taking about 24 hours to mature each group. Here again there is variability, for a young fresh female is capable of producing a group every twelve hours for a short time. By actual count of 309 groups of eggs, 90.9 per cent were laid with six eggs, 5.8 per cent with 5, while the remaining 3.3 per cent were divided into two groups of four eggs, two or three, two of seven, one of two and one of ten eggs. The group containing the ten eggs was laid by one female

over a period of two days and constitutes two groups with but one silken covering.

The ovaries work together and each matures three eggs which apparently are laid alternately.

(To be continued)

Descriptions of Seven New Western Ants. (Hymenop.: Formicidae).

By A. C. Cole, Jr., P. O. Box 623, Lansing, Michigan.

Myrmecocystus melliger subsp. mimicus Whlr. var. **californicus** var. nov.

Worker—Length, 4.5 mm. Differing from the worker of the typical *mimicus* as follows: Entire body hairy and shining. Clypeus, cheeks, mandibles, and legs, except tibae and tarsi, of a deep reddish brown. Antennae, tibiae, and tarsi much lighter. Mandibular teeth, thorax, and petiole dark brown; gaster black.

Described from numerous workers collected from a single nest by the author at Weed, California. The *holotype* is in the author's collection and *paratypes* are to be deposited in the collections of the U. S. National Museum and Dr. C. H. Kennedy.

Myrmecocystus mexicanus Wesm. subsp. **idahoensis** subsp. nov.

Worker—Length, 3-6.5 mm. Differing from the worker of the typical *mexicanus* as follows: Head, including mandibles, only slightly longer than broad. Scapes of antennae only sparsely hairy. Mandibles 7-toothed; apical tooth pronouncedly curved; remaining teeth rather indistinct, their tips straight or only slightly curved. Thorax compressed, more robust than that of *mexicanus* or its variety *horti-deorum*. Declivity of epinotum decidedly rounded, base more flattened. Legs comparatively shorter. Petiole convex, its apex rather blunt but without a median impression; apex hairy. Gaster only slightly longer than broad, less elongate than in *mexicanus* or *horti-deorum*.

Hairs of gaster short on dorsum, longer on venter, fewer on antennal funiculi. Surface somewhat shining, thinly pubescent, less hairy than that of *horti-deorum*. Thorax and legs a uniform light tan, head slightly darker; mandibular teeth dark brown to black; gaster fuscous.

Female—Length, 9 mm. Differing from the typical *mexicanus* in the following characters: Head, excluding mandibles, slightly broader than long. Last joint of maxillary palpus about half as long as the penultimate joint. Thorax very broad and robust. Petiole rather blunt. Wings 10 mm. in length, veins light brown, stigma darker; hind wings distinctly irridescent. Gaster longer than thorax.

Head and mandibles, except teeth, reddish brown; mandibular teeth black; thorax shiny yellow-brown, darker than gaster; legs and antennae uniformly dull yellow; venter of gaster and head lighter than dorsum.

Male—Length, 6 mm. Head small, including mandibles, as broad as long. Mandibles with 1 to 3 minute and uneven teeth, in addition to the apical tooth, which is small, pointed, thick, and only slightly curved. Thorax robust, greatly compressed, much broader than head, thicker than gaster. Wings hyaline, discoidal cell large and distinct. Petiole thick, blunt, and unnotched. Gaster strongly elliptical.

Pilosity and pubescence as in worker. Surface shining. Head and thorax, with exception of pronotum, black; pronotum dark reddish brown. Gaster dark brown, slightly lighter ventrally. Femora and tibiae dark ash-grey, tarsi light yellow. Veins and stigmae of wings light brown.

Described from numerous workers, males and females, collected by the writer at Hollister, IDAHO. Additional localities are Rogerson, Indian Cove, Hagerman, and Twin Falls, Idaho. The *holotype*, a worker, from Hollister, is in the author's collection and *paratypes* are to be deposited in the collections of the U. S. National Museum and Dr. C. H. Kennedy.

MYRMECOCYSTUS MELLIGER subsp. SEMIRUFUS Emery var. **kennedyi** var. nov.

Worker—Length, 3-5 mm. Much the same as the worker of the typical *semirufus*, with the following exceptions: Head and gaster more hairy than thorax; pubescence on gaster slight or absent; erect hairs long and rather abundant, uniformly distributed. Surface shining, gaster more so than head and thorax. Head and thorax tan, gaster jet black.

Female—Length, 8.5 mm. Head, excluding mandibles, broader than long. Mandibles 7-toothed; apical tooth pronounced, sharp, only slightly curved. Discoidal cell of wings large and distinct. Petiole rather acute, deeply notched and hairy. Gaster globular; hairs suberect and short; pubescence scant.

Surface, especially of mesonotum, shining. Head and thorax light brown; apical tooth black. Gaster silky black, its sutures and genitalia light brown.

Male—Length, 5 mm. Neck shorter and more robust than in males of related forms. Apical tooth of mandibles short and rather blunt; other teeth lacking. Discoidal cell of wings present but recurrent vein faint; stigma faint.

Surface shining, gaster more so than head or thorax. Head, except antennal funiculi, black; funiculi yellow. Thorax, except mesonotum, and legs, except tarsi, brown; mesonotum black; tarsi dusty yellow; gaster black.

Described from a series of 150 workers, 20 females and 75 males, collected by the writer from small crater nests (about 11 cm. in diameter) at Indian Cove, IDAHO. I name this variety in honor of my friend and teacher, Dr. C. H. Kennedy. The *holotype*, a worker, is retained in the author's collection, and *paratypes* are to be deposited in the collection of the U. S. National Museum and that of Dr. C. H. Kennedy.

MYRMECOCYSTUS MELLIGER subsp. SEMIRUFUS Emery var. **romainei** var nov.

Worker—Length, 4-5 mm. Same as worker of the typical *semirufus* except that the vertex of the head, antennal funiculi, thorax, petiole, and legs are of a dark reddish brown.

Described from a series of 54 workers taken by Miss Marjorie Romaine, at Cameron, ARIZONA. The *holotype* is in the author's collection, and *paratypes* are to be deposited in the collections of the U. S. National Museum and of Dr. C. H. Kennedy.

DORYMYRMEX PYRAMICUS Roger var. **smithi** var. nov.

Worker—Length, 3.5-5 mm. Larger and more shining than worker of the typical *pyramicus*. Head, legs, and petiole reddish brown; gaster black.

Described from a series of 27 workers collected by the writer at North Platte, NEBRASKA. This variety has been named for Dr. M. R. Smith whose helpful criticisms and suggestions are so much appreciated by the author. The *holotype* is in the author's collection and *paratypes* are to be deposited in the U. S. National Museum.

POGONOMYRMEX BARBATUS F. Smith subsp. **curvispinosus** subsp. nov.

Worker—Length, 7-7.5 mm. Differing from workers of described forms of *barbatus* as follows: Epinotal spines long and rather strongly curved forward. Head and mandibular teeth black; mandibles, antennae, thorax, legs, petiole, and postpetiole light to dark reddish brown; gaster very dark reddish brown, lighter anteriorly and posteriorly; femora infuscated.

Described from a series of 20 workers collected by the author 36 miles south of Prescott, ARIZONA. The ants inhabited a large flat mound of pebbles along U. S. highway 89. The workers were deep within the ground at mid-day so that it was only with extreme difficulty that a series, significant of the subspecies, was obtainable from the rocky soil.

The *holotype* is in the author's collection, and *paratypes* are to be deposited in the collections of the U. S. National Museum and of Dr. C. H. Kennedy.

IRIDOMYRMEX PRUINOSUS Roger var. **testaceus** var. nov.

Worker—Length, 2-2.3. Same as workers of *pruinosus* but lighter in color, being testaceous with vertex of the head darker, tip of gaster infuscated, and legs and anterior portion of gaster lemon yellow to testaceous.

Female (deälate)—Length, 5 mm. Dark brown, with testaceous mandibles, cheeks, and legs.

Described from a series of 50 workers and 1 deälated female collected by the author at Twin Falls, Idaho. Other localities: Hagerman, Buhl, and Hollister, IDAHO.

The *holotype*, a worker, from Twin Falls, is in the writer's collection, and *paratypes* are to be deposited in the collections of Dr. C. H. Kennedy and the U. S. National Museum.

Three New Butterfly Races (Lepid.: Nymphalidae, Lycaenidae).

By WILLIAM D. FIELD, Lawrence, Kansas.

NYMPHALIS * CALIFORNICA Bdv. new race **herri.**

This is a northern race and it differs from typical *californica* Bdv. in having the ground color of the upper side of both primaries and secondaries more of a burnt orange. Typical *californica* as described by Boisduval is fulvous. The yellow markings of *californica*, which are located on the outer side of all the black spots in the discal and limbal areas, are in this new race less yellowish and more mixed with the ground color. Thus this race appears on the whole darker-colored than does *californica*.

Underneath. On the whole darker than in typical *californica*. This is especially noticeable in the area bordering the outer side

* The generic names used in this article were adopted from Francis Hemming, "The Generic Names Of The Holarctic Butterflies". vol. 1, 1934.

of the dark, angular, transverse band which runs through the discal part of primaries and secondaries. In typical *californica* this area is light-colored, almost white. In *herri* this area is nearly as dark as the rest of the limbal area.

Data: *Holotype* ♂, expanse 49 mm.; Buckhorn Mountains, WASHINGTON, July 25, 1934. *Allotype* ♀, expanse 50 mm.; same locality and date. *Paratype* ♀, expanse 54 mm.; Excelsior, Washington, July 20, 1934. Twelve *paratypes* ♂, Priest River, IDAHO, various dates in July, 1930, C. W. Herr. Types in author's collection and collection of C. W. Herr. Named for C. W. Herr, a well-known collector, of Woodburn, Oregon.

Note. Compared with specimens from San Gabriel Mountains, California, June 20, 1932, collected by Berkley Powell. and with specimens from Sonoma County, California, June, 1931, collected by J. W. Tilden. Also compared with the original description by Boisduval and with figures given in John Adams Comstock's book, "Butterflies of California." These latter are of specimens taken on Mt. Wilson, Los Angeles County, California. All of the above specimens were found to be typical *californica*.

LYCAENA EDITHA Mead new race **montana.**

♂. Upper side. Not different from typical *editha* Mead, except that the anal angle and margin of secondaries have no indication of orange scales or patches.

Under side. Primaries; Mead says of *editha* in the original description, "Under side of fore wings gray inclining to fuscous, cinereous on the disc. . . ." In this new race the ground color is much more of a yellowish grey than in *editha*. Secondaries; it is here we find the greatest distinguishing character of *montana*. Ground color much darker, especially toward the base of the wings. The spots of discal and basal areas, which in typical *editha* are "pale gray fuscous edged with black and surrounded by white," are in this new race a darker brownish grey and are of a uniform color throughout, or at least they are not edged with black. Moreover, they are surrounded by a more distinct circle of white than is found in typical *editha*. The spots of the discal and basal areas are much enlarged in this new race, many of the pairs being almost connected.

♀. Upper side. As in typical *editha* there is present a small fulvous or ochraceous cloud upon the fore wing disc and a similarly colored streak on the inner angle.

Under side. Differs from typical *editha* in the same ways that the male of *montana* differs from males of *editha.*

Data: *Holotype* ♂, expanse 27 mm.; Broadwater County, MONTANA, July 30, 1930. *Allotype* ♀, expanse 27 mm.; same locality and date as holotype. Seven male and two female *paratypes,* same locality and date. One male *paratype,* Yellowstone Park, July 16, 1934. All types in author's collection.

Note. Compared with a series of typical *editha* from El Dorado County, California, near the type locality, Lake Tahoe. LYCAENA HETERONEA Bdv. new race **klotsi.**

This race oddly combines some of the characters of the three other races of this species. On the upper surface the male has the violet blue color of *clara* Hy. Edw. with narrower black margins than in *heteronea* Bdv. *Heteronea* is metallic blue above. On the characters of the under side of the male, typical *Klotsi* cannot be separated from typical *heteronea* Bdv.

The author would be inclined to believe that this is only a color form of *heteronea,* if it were not for the series of females taken with the males. They are of a lighter color above than typical *heteronea* or *gravenotata* Klots and, like the females of the latter, they lack the marginal row of orange brown lunules found on the upper side of secondaries of typical *heteronea.* The under side is not different from typical *heteronea,* as before stated.

Briefly one might characterize this race as follows: the under side of male and female are like the under side of *heteronea,* the upper side of male is similar to *clara* Hy. Edw. and the upper side of *klotsi* female is similar to *gravenotata* Klots, in lacking orange brown lunules on the margin of secondaries, but is lighter in color than *gravenotata.* The ground color is greyish brown.

External genitalia. The holotype and paratype males, in addition to two other specimens of typical *klotsi,* were dissected for study. A series of four males of typical *heteronea* from El Dorado County, California, and one male of the race *gravenotata* from Estes Park, Colorado, were also dissected for study. It was found that the harpes of the Montana race were generally broader throughout their length and noiceably shorter than were the harpes of the other two races. *Heteronea* seemed to have the narrowest and longest harpes. The most constant difference between these races is found in the pair of hooks which are connected to the base of the uncus. In *klotsi* the ends of these hooks point more toward their base and make a little less than a curved right angle bend. In *heteronea* the

hooks make a gradually curved right angle bend. In *gravenotata* these hooks make a more sharply curved right angle bend and are somewhat longer.

Data: *Holotype* ♂, expanse 30 mm.; Broadwater County, MONTANA, July 30, 1930. *Allotype* ♀, expanse 31 mm.; same locality and date. Five male and five female *paratypes*, same locality and date. One male *paratype*, Albany County, WYOMING, July 25, 1928. Types in the author's collection. One pair of paratypes to be presented to Dr. Alexander B. Klots for whom this new race is named. One pair of paratypes to be presented to the Los Angeles Museum in care of Dr. J. A. Comstock.

Taxonomic Problems in Lepidoptera.

By G. F. FERRIS and MICHAEL DOUDOROFF, Stanford University.

This paper is a synthesis of the views of its authors, of whom one—the junior—is a student and collector of the diurnal Lepidoptera and the other is interested in the general problems of systematic work and not at all in the butterflies. It is called forth as a protest, from both points of view, against certain practices which are current especially among Lepidopterists. It is presented as an expression of the belief that systematic work has as its function something more significant than the mere furnishing of names which may be attached to a few specimens in a cabinet.

It would seem reasonable to expect that before undertaking to do systematic work the student should have a clear conception of the purpose and significance of such work and of the function and limitations of the nomenclatorial procedure employed. Whatever the aims of systematic work may be, ranging from the philosophical ideal of "charting the course of evolution" to the purely practical purpose of permitting the identification of species, it would seem clear that the function of the associated nomenclatorial system is that of indexing the biological facts which are revealed in the course of systematic studies. Nomenclature is not synonymous with systematics. It is but

a tool of the systematist and as a tool it should be kept as trenchant as possible.

If we thus regard our nomenclatorial system as a means of indexing a body of fact, it is evident that it should be kept as simple as is consistent with its function. Furthermore, it must be realized that the method of indexing may be varied at certain stages just as—for example—in preparing a bibliography we may index first by subject, then by author and then chronologically.

In our system of taxonomic nomenclature we are but little troubled by complexities of indexing the higher categories. As a matter of fact, our system of naming these is naively simple, certainly far too simple adequately to express the facts. But when we come to the species we get into difficulties. These difficulties arise from two sources. One source is the complexity of the biological situations involved. The other is the purely nomenclatorial problem of how to index these situations.

It should be evident that an index can not be completed before the book is written. In other words, no very satisfactory nomenclatorial arrangement intended to index the body of fact involved in connection with a species can be designed until we are fairly clear about species themselves. To name sub-species, varieties, formae, races, transition forms, aberrations and the like when we can not even define what we mean by species is an absurdity. And at this point we have a serious difficulty involved in the rule that "specific and sub-specific names . . . are of the same value." The term "sub-specific" as here used is generally interpreted to mean any scientific name applied to a category less than the species. Here, at the point of greatest confusion in our thinking, where systematists argue even as to the reality of species, is also the point of greatest confusion in nomenclature. Formal scientific names in Latin form, required by our nomenclatorial code to be recognized if properly published, are applied indiscriminately to categories of undefined status and significance by authors who have little realization of what their activity is all about.

Two things seem to us to be desirable. First, the development of a clearer concept of the meaning of the word species. Second, a change in the method of indexing—that is in the

nomenclatorial procedure—at the point where we begin to deal with categories less than the species.

We can not here develop at length our argument concerning the definition of species. We simply state that the term is conceived of by us as properly covering "a population the members of which form an inter-linked genetic complex." As thus conceived the species is a broad group involving perhaps in some cases hundreds of minor groups of many degrees of difference from each other.

To make clear our meaning, let us consider the species *Drosophila melanogaster* upon which so much experimental work has been done. Here is a population—occurring out of doors as well as in bottles—the members of which differ among themselves to such an extent that something more than four hundred genetically fixed forms have been segregated, all of which are genetically compatible with each other and form a genetically inter-linked complex having a genetic constitution such that the population as a whole is definitely separated from other species populations of the genus *Drosophila.*

This is a species. Its name, *Drosophila melanogaster,* stands as the key index symbol for an enormous body of fact that has been accumulated concerning the species. And at this point the geneticists have wisely abandoned the method of index symbolism employed in our formal scientific nomenclature and have adopted a different system. Instead of formal scientific names they have employed a series of "nicknames" which adequately meet their needs. We may be grateful to them that they have not proposed 400 or more names in Latin form for these sub-species or varieties or formae or whatever they may be with the resulting necessity of listing these names in our catalogues and establishing their validity and priority. The nomenclatorial system remains simple and the biological situations are adequately indexed.

Systematists might well profit by this example. True, in some cases the situation is more complex than in *Drosophila,* since we may have to deal with regional forms, seasonal forms, color phases and the like as well as with possible mutations, and yet it is not fundamentally different. It can be met essentially as it has been met by the geneticists.

We are inclined somewhat to doubt that any formal scientific name should be given to any category less than the species. A case can be made out for the naming of the sub-species as understood by mammalogists and ornithologists, to whom it implies a form genetically fixed and geographically circumscribed and generally regarded as perhaps the most probable material from which distinct species may arise. But certainly the formal naming of every recognizably different specimen, of every mutation, aberration, seasonal form, altitudinal form, color phase and the like is uncalled for. Certainly some other method of referring to such material can be developed.

Among the aphids, for example, there may be a quite elaborate sequence of seasonal forms, differing materially from each other. Yet students of this group do not find it necessary to assign formal names to each member of the sequence. Stem mother, apterae, alatae, sexuparae, migrantes and the like adequately index their position under the specific name.

All of this applies with special force to the systematics of the diurnal Lepidoptera. Butterflies are usually highly localized by climatic conditions and host plants so that it is often impossible to determine from collecting records and from specimens alone what the status of a form may be. Until breeding experiments have been carried out, or definite inter-gradation with its implication of genetic compatibility has been shown, such geographical groups are perhaps best set off as species, lest in recoiling from the extremes of over-zealous splitters we become gross lumpers. Thus, Gunder's lumping of the American species of the genus *Euphydryas* into five species can hardly be justified by similarities of genitalia alone.[1]

There are also among the butterflies genetic and environmental forms occurring in company with the normal, which have been named and to whose names collectors have clung tenaciously. The genetic forms, such as polymorphic sexual forms, some albinos, and mutants (not so-called transition forms) may be compared to such variants of the human species as blue-eyed or haemophilic individuals. The environmental

[1] Doudoroff, M.—*Pan-Pacific Entomologist*, Vol. 11, p. 144. 1935.

forms include seasonal and some altitudinal forms, most dwarfs, almost all aberrations and "transition forms," injured specimens, chrysalis burns and the like which may appear in collections and whose latinized and formally validated names are appearing in greater and greater numbers. Hundreds of names have appeared for "transition forms," individuals supposedly forecasting or reminiscent of fashions in butterfly attire but as shown by numerous investigators actually freaks easily produced in the laboratory and having no genetic significance. (Feldotto [2] and Prochnow. [3])

As far as the formal scientific nomenclature, subject to the established nomenclatorial code, is concerned, these forms should be disregarded. They can properly be recorded in some other way. The junior author, as a student of the Lepidoptera, pleads with his colleagues to abandon the orgy of indiscriminate naming, to straighten out the synonymic lists by discarding superfluous names and to spare the butterflies the nomenclatorial disrepute arising from the situation that is developing. And the senior author, not at all interested in butterflies beyond being amused by the vagaries of their devotees, clings to the hope that systematic workers in other fields may eventually escape from the fog that envelopes much of their work and develop a system more soundly grounded upon biological knowledge and less concerned with the validation of names.

A New Species of Anomiopsyllus from Montana (Siphonaptera)

By BENJAMIN J. COLLINS, National Institute of Health, U. S. Public Health Service.

Material recently placed at our disposal through the kindness of Drs. Adolph Rumreich and Carroll Fox, together with specimens of a hitherto undescribed species which have been in our collection for some time, enables us to give the following notes on the species of *Siphonaptera* which constitute the Nearctic genus *Anomiopsyllus* Baker, 1904.

[2] Feldotto, W.—*Archiv für Entwicklungs—Mechanik der Organismen*, Bd. 128, pp. 299-341. 1933.

[3] Prochnow, O.—Schröder's *Handbuch der Entomologie*, Bd. 2, pp. 430-572. 1929.

Anomiopsyllus montanus spec. nov. (figs. 1-2).

Anomiopsyllus nudatus Dunn & Parker, 1923 (nec Baker, err. determ.), Public Health Repts., v. 38 (47), 2774, 2775 (Canyon Creek, W. of Hamilton, Mont., on *Bubo virginianus occidentalis*).

Distinguished from *A. nudatus* (Baker, 1898) and *A. falsicalifornicus* Fox, 1929, by the modified abdominal segments.

♂. 1st abdominal tergite with 7 apical teeth on the 2 sides

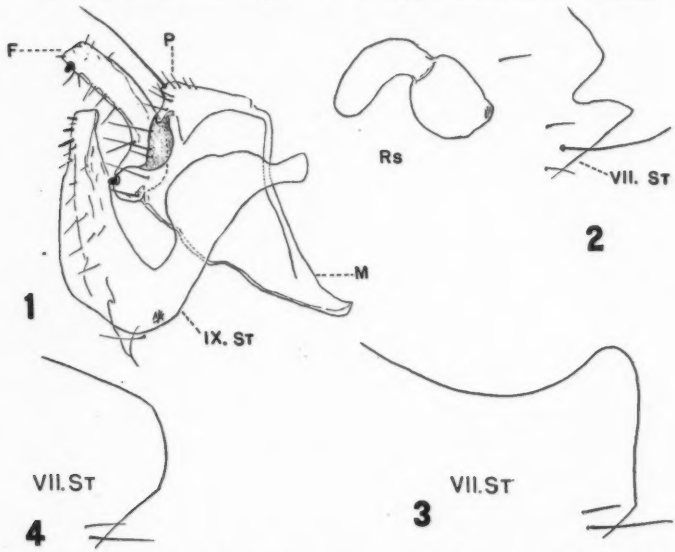

Fig. 1.—Genitalia of *Anomiopsyllus montanus* n. sp., ♂. F Exopodite, IX. St. Ninth sternite, M Manubrium, P Immovable process.

Fig. 2.—*Anomiopsyllus montanus* n. sp., ♀. Rs Receptaculum seminis, VII. St. Seventh sternite.

Fig. 3.—Seventh sternite of *Anomiopsyllus nudatus*, ♀.

Fig. 4.—Seventh sternite of *Anomiopsyllus falsicalifornicus*, ♀.

together. Exopodite F (fig. 1) finger-like, of nearly even width, the truncated apex directed posteriorly. On posterior margin, a small, subapical, bluntly rounded spiniform. Below the spiniform a row of 6 weak bristles in the apical half. At the insertion of exopodite on the postero-ventral angle of clasper another spiniform, above this a single bristle in the basal half. Process P of clasper shorter than in *A. nudatus*, its posterior margin incurved for a short distance below apex. Apical bristle

of process P not so long as antepygidial bristle. A row of 8 (including acetabular) bristles on posterior margin of clasper, the upper 3 somewhat submarginal. In addition, 3 or 4 bristles on dorsal margin anterior to apical bristle. Horizontal arm of IX sternite broadest below middle, narrowing toward apex, the anterior margin membranous in the apical half. On posterior margin below truncated apex, 3 stout and several weak bristles. Vertical arm of IX sternite of same general shape as in *A. nudatus*, but the apex more dilated.

♀. Differs from the other known species of the genus as follows: Maxillae not pointed at apex. VII sternite (fig. 2) with a sinus of medium depth, the lobes of about equal length, the lower more pointed than upper. Head of spermatheca subglobular, slightly flattened on one side, shorter than tail; tail more strongly ventricose. Anal sternite angulate ventrally.

Holotype (♂) and *allotype* (♀) Nat. Inst. Health Cat. No. 11984, are two of the eight specimens recorded by Dunn & Parker, *loc. cit.*

ANOMIOPSYLLUS NUDATUS (Baker, 1898) (fig. 3).

Typhlopsylla nudata Baker, 1898, J. N. Y. Ent. Soc., v. 6(1), 56 (♀, Tucson, Ariz., on *Neotoma albigula*).

Anomiopsyllus nudatus (Baker); Baker, 1904, Proc. U. S. Nat. Mus., v. 27(1361), 426 (♀); Fox, 1914, Hyg. Lab. Bull. No. 97, pl. 19, fig. 53(spermatheca); Jord. & Roths., 1915, Ectopar., v. 1(1), 45, fig. 48 (♂).

Anomiopsyllus californicus Baker, 1904, Invert. Pacifica, v. 1, 39-40 (♀, Claremont, Calif., on *Spilogale phenax*); Jord. & Roths., 1915, Ectopar., v. 1(1), 45 (= *nudatus*).

♀. The VII abdominal sternite not having been illustrated, we take the opportunity of giving a figure of that sclerite for comparison. The figure, prepared in collaboration with Dr. H. E. Ewing, is based on the type specimen in the U. S. Nat. Mus. The dorsal margin of the segment is strongly incurved, with the posterior dorsal angle evenly rounded; posterior margin almost straight.

ANOMIOPSYLLUS FALSICALIFORNICUS Fox, 1929 (fig. 4).

Anomiopsyllus californicus Fox, 1926 (nec Baker, err. determ.), Pan-Pacific Ent., v. 2(4), 183-184, figs. 5, 9 (♂♀, Los Angeles Co., Calif.); Wagner, 1930, Mag. d. Parasitol., v. 1, 135, pl. 12, fig. 76 (♂).

Anomiopsyllus falsicalifornicus Fox, 1929, ENT. NEWS, v. 40 (7), 218 (♂♀).

♀. We figure the outline of the VII sternite from a paratype kindly loaned by Dr. Carroll Fox. The sclerite (fig. 4) is produced into a broad lobe, evenly rounded posteriorly.

A new Pecan Sawfiy, Megaxyela langstoni n. sp. (Hymenoptera : Xyelidae)

By HERBERT H. ROSS, Illinois State Natural History Survey, Urbana, Ill.

During the last few years Mr. J. M. Langston of the Mississippi Agricultural Experiment Station has reared several sawflies from the pecan. Among these was a series of adults representing a new species, *Megaxyela langstoni.*

The larva of this species was recorded by Dyar in 1898 and Yuasa in 1923 as *major.* Mr. Langston and I, however, believe that the larva keyed out by Yuasa as *Megaxyela sp. 1* may prove to be true *major.* The larva of *langstoni* has a large dark area on the pronotum and penultimate abdominal segment, whereas Yuasa's "species 1" has these areas replaced by pairs of black spots. This latter species appears to be a solitary feeder on pecan and some other hickories; *langstoni* is gregarious.

Megaxyela langstoni n. sp.

Megaxyela major Dyar (*nec.* Cresson), Can. Ent., vol. 30, no. 7, July, 1898, p. 175; Yuasa (*nec.* Cresson), Ill. Biol. Monographs, vol. 7, no. 4, Feb. 9, 1923.

This species runs easily to *M. major* (Cresson) in existing keys to members of the genus. It is readily separated from *major,* however, in having the abdominal dorsum chestnut instead of mostly black, a black area at the base of the stigma, and much less yellow at the base of the hind femora and tibiae.

♀.—Length 10 mm. Color uniformly chestnut brown with the following exceptions: head below antennae, tegulae, alar sclerites, margins of all sternal portions of abdominal sclerites, extreme apex of coxae, all trochanters, base and apex of front and middle femora, all but apex of front and middle tibiae, a very narrow ring at base and apex of hind femora, basal fifth or less of hind tibiae, and hind tarsi, *yellow;* front and middle tibiae varied yellow and chestnut; a spot at base of each antenna, extreme upper corner of mesepisternum, sometimes spots on anterior margin of mesonotum and spots on ventral portion of tergites 5, 6 and 7, *black;* wings slightly smoky, especially below stigma, veins mostly dark brown, stigma clear chestnut with antero-proximal area (constituting one-third to one-half of the total) almost black.

Structure almost identical with all other members of the genus in regard to mouthparts, punctuation, venation, etc. Head and thorax dull with very fine striate shagreening. Abdomen shining. Sheath flat and broad, typical of genus, differing from that of *major* in being distinctly shorter than the hind basitarsus rather than distinctly longer.

♂.—Lengh 9 mm. Similar in color and structure to female, except for genitalia, which are similar to other members of the genus.

Holotype: ♀; State College, MISSISSIPPI, April 7, 1932, coll. J. M. Langston, reared from pecan (*Carya pecan* A. & G.). Deposited in the collection of the Illinois State Natural History Survey. *Allotype:* ♂; same data. *Paratypes:* 6♀♀, same data as holotype; 1♀, same data but coll. Mar. 24, 1932; 1♂, 1♀, Lucedale, Miss., reared from pecan, emerged Mar. 28 and Apr. 2, 1931, respectively, coll. H. Dietrich. In the collections of the Mississippi Agricultural Experiment Station and the Illinois State Natural History Survey.

The Silphidae of Nebraska (Coleoptera).

By F. G. Meserve, University of Nebraska, Lincoln, Nebraska.

The purpose of this paper is to list the Silphidae that occur in Nebraska, to show their geographic and seasonal distribution and their relative abundance. The material studied is in the permanent collection of the Department of Entomology of the University of Nebraska. The nomenclature is that of Leng's "Catalogue of the Coleoptera of North America, North of Mexico." The writer wishes to acknowledge suggestions and assistance given him by the following: Professors M. H. Swenk, D. B. Whelan and Raymond Roberts of the University of Nebraska, Mr. C. A. Frost of Framingham, Massachusetts, Mr. J. W. Angell of New York City, and Mr. A. J. Mutchler of the New York Museum.

1. NECROPHORUS CAROLINUS Linn. Scarce. Throughout the state; Valentine, Mitchell, Dewey Lake in Cherry Co., Haigler, Imperial, Bloomington. One at Lincoln. 28 spmns. V. 27 to VII. 21.

2. N. AMERICANUS Oliv. Scarce. Only four in the collection. One at Neligh, Antelope Co. without date. Three at Lincoln VI., VII. + IX. 21.

3. N. ORBICOLLIS Say. Rather scarce at scattered points in the eastern, north-central and extreme western parts of the state; at Carns, South Bend, Clearwater, Hogan's Bridge in Rock Co., Lincoln, West Point, Valentine, and War Bonnet Canyon in Sioux County. 8 spmns. V. 17 to VIII.

4. N. MARGINATUS Fab. Abundant throughout the state. Mitchell, Dewey Lake, Spencer, Niobrara, Maskell, Concord, South Sioux City, West Point, David City, Lincoln, Fairmont, Valentine, Curtis, Bloomington, Elm Creek, Reynolds, Haigler, Glen, Monroe Canyon and War Bonnet Canyon in Sioux County. Collected "at dead mice" at Glen. 104 spmns. V. 27 to X. 22.

5. N. OBSCURUS Kby. Scarce. In eastern, northern and extreme northwestern parts of the state. Mitchell, Pine Ridge, Carns, West Point, Harrison and Lincoln. 6 spmns. VII. to IX. 27.

6. N. GUTTULA Mots. Scarce. In the extreme eastern and northwestern parts of the state. West Point, Pine Ridge, War Bonnet Canyon. 4 spmns. VI. + VII.

7. N. GUTTULA HECTATE Bland. Scarce. Only in the extreme northwestern and north-central portions of the state. Taken at Mitchell, Glen, War Bonnet Canyon and Valentine. 11 spmns. V. 22 to VIII. 17.

8. N. PUSTULATUS NIGRITUS Mann. Two specimens in the collection. Lincoln, without date.

9. N. TOMENTOSUS Web. Rather common in eastern, northern and extreme northwestern parts of the state. None in central and southwestern portions. Monroe Canyon, Glen, Fairmont, West Point, Omaha, Carns, Spencer, and eleven at Lincoln. 49 spmns., VI. 10 to IX. 22.

10. PHILAS TRUNCATA Say. One specimen from Haigler, Dundy County. Collected by J. T. Zimmer, VII. 8, 1911.

11. SILPHA SURINAMENSIS Fab. Common in eastern part of state. Also in north and south-central portions, none from extreme west. Carns, Spencer, Omaha, Nebraska City, Fairmont, McCook, DeWitt, Cortland, Ashland, and 28 from Lincoln. Fifteen of the total of 48 spmns. were "collected at electric light." IV. 7 to X. 7. Common in June and July.

12. S. LAPPONICA Hbst. Throughout the state. Scarce in the east but abundant in the extreme northwestern part. Ravenna, War Bonnet Canyon and Monroe Canyon, Pine Ridge, Dewey Lake in Cherry Co., Halsey, Glen, Concord, West Point, Valentine, one at Haigler, and nineteen at Mitchell. 68 spmns. V. 6 to X. 28, mostly VI.

13. S. INAEQUALIS Fab. Common in eastern, none in central and western parts of the state. Neligh, West Point,

Omaha, South Bend, two at Bellevue "under dead turtle," thirteen at Lincoln. 32 spmns. IV. 11 to VI. 25.

14. S. NOVEBORACENSIS Forst. Scarce. In eastern and extreme northwestern parts of state. One from Lincoln, without date. One labelled "Neb," seven from Monroe Canyon, one from War Bonnet Canyon and three from Cedar Bluffs. 13 spmns. IV. to VIII. 26.

15. S. AMERICANA Linn. Rather scarce. Omaha, West Point, Valentine, Dewey Lake. 11 spmns. V. 27 to VII. 10.

16. S. RAMOSA Say. Scarce. Hackberry Lake, Trout Lake and Valentine in Cherry Co., Mitchell, and one at Lincoln, without date. 9 spmns. VI. 16 to VII. 22.

17. S. OPACA Linn. The Department of Entomology has a record of one specimen sent in by Ricksecker. No record is given except that it was taken in Nebraska. The specimen is missing.

18. CHOLEVA TERMINANS Lec. Only one specimen. Taken by Henry F. Wickham at West Point in Cuming County, April, 1888.

19. COLENIS IMPUNCTATA Lec. One specimen. Cedar Bluffs in Sarpy Co. in April. Collected and identified by H. F. Wickham.

20. AGATHIDIUM EXIGUUM Melsh. One specimen, taken at Pine Ridge in July. Collected and identified by H. F. Wickham.

21. AGLYPTINUS LAEVIS Lec. Two specimens; both from Ashland, without date. Collected and identified by H. F. Wickham.

INSECT ENEMIES OF SHADE-TREES. By GLENN W. HERRICK, Professor of Economic Entomology in Cornell University. Ithaca, New York, Comstock Publishing Co., Inc. 1935. 8vo, pp. xi, 417, 321 figs. $5.00.—This book is intended for all persons interested in preserving shade trees. The first chapter therefore appropriately discusses the value of shade-trees and general methods of protection from insect attack. Two lists indicate the comparative value of 26 shade-trees; one by the author shows their susceptibility to insect attack, the other, from Fernow, is founded on several characters of each tree which contribute to its general worth (pp. 4, 5). The positions in the two lists of the same tree are mostly very different. Spraying apparatus, insecticides and the treatment of weakened trees occupy Chapters II and III. Chapters IV-XXVII treat of the insect enemies of twenty-four chief shade-trees whose names are arranged in alphabetical order, XXVIII of those of smaller trees and shrubs, XXIX of those of evergreens other than pines, while XXX is devoted to some miscel-

laneous insect enemies of trees and shrubs. Judging from the two indexes which close the volume, about 230 species of trees and shrubs and about 700 species of insects and mites are mentioned in more or less detail. Taking Chapter XIX, Insect Enemies of the Oak, as a sample of the book, after briefly discussing the chief species of eastern American oaks, 8 beetles, 15 moths, 12 galls, 3 scales and 1 walking stick are described in their various stages and the means of destroying each are given. To the account of each species, or group of species, references to recent literature are appended. Names only of 8 other beetles, 4 more moths and 3 additional scales and aphids "which may attack oaks" are listed. Most of the illustrations are good and clear. For the text the jacket claims that "only that material is presented which is pertinent to the questions of injury by and control of the insects." This describes well the reading matter. The book appears to be a useful compendium of its subject.—P. P. CALVERT.

Entomological Literature

COMPILED BY V. S. L. PATE, LAURA S. MACKEY and E. T. CRESSON, JR.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

The **figures within brackets** [ ] refer to the journal in which the paper appeared, as numbered in the list of Periodicals and Serials published in our January and June issues. This list may be secured from the publisher of ENTOMOLOGICAL NEWS for 10c. The number of, or annual **volume.** and in some cases the part, heft, &c. the latter **within** ( ) follows; then the pagination follows the **colon** :

All continued papers, with few exceptions, are recorded only at their first installments.

(*) Papers containing new forms or names not so stated in titles, have an * within parentheses thus (*) following the pagination of reference to paper.

(S) Papers pertaining exclusively to neotropical species, and not so indicated in the title, have the symbol (S) at the end of the title of the paper.

For records of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington. Also Review of Applied Entomology, Series A, London. For records of papers on Medical Entomology, see Review of Applied Entomology, Series B.

Note. Titles of papers containing new forms or new names will be indicated by an asterisk within parentheses at end of reference, (*).

Papers published in the Entomological News are not listed.

GENERAL.—Parks, T. H.—Insects on elms. [Ohio St. Univ. Agr. Ext. Serv.] Bull. 172. 32 pp., ill. **Uichanco, L. B.**—Ourselves as Gullivers in the lilliputian world of insects. [Philip. Agriculturist] 24: 805-810. **Warnecke, G.**—Uber die Konstanz der okologischen Valenz einer Tierart als Voraussetzung fur geographische Untersuchungen. Eine literarhistorische Studie. [17] 53: 203-206.

ANATOMY, PHYSIOLOGY, ETC.—Bialaszewicz, K.—Recherches sur le metabolisme chimique et energetique pendant le developpement des Insectes. [Kosmos] 58: 21-33. **Blackwelder, R. E.**—Morphology of the coleopterous family Staphylinidae. [Smiths. Misc. Coll.] 94, No. 13: 102, pp., ill. **Bowen, M. F.**—A biometrical study of two morphologically similar species of Trichogramma. [7] 29: 119-125, ill. **Butt, F. H.**—The early embryological development of the parthenogenetic alfalfa snout beetle, Brachyrhinus ligustici. [7] 29: 1-10, illus. **Friedl, A.**—Beitrag zur Morphologie von Caliroa annulipes (Hymen: Tenthredinidae). [56] 14: 311-317, illus. **Goetze, H.**—Hemerocampa leucostigma. Eine Aufzucht aus dem Ei. [18] 49: 515-518. **Herfs, A.**—Oekologisch-physiologische studien an Anthrenus fasciatus. [Zoologica, Stuttgart] 34, hft. 90. 95 pp., ill. **Key, K. H. L.**—Observations on rate of growth, coloration, and the abnormal six-instar life-cycle in Locusta m. migratorioides (Orthop: Acridid.). [22] 27: 77-85. **Landis, B. J.**—Alimentary canal and malphigian tubules of Ceratomegilla fuscilabris (Coleo: Coccinellid.). [7] 29: 15-28, ill. **Lindgren, D. L.**—The respiration of insects in relation to the heating and fumigation of grain. [Univ. Minn. Agr. Exp. Sta.] Tech. Bull. 109, 32 pp., ill. **Miller, F. E.**—A histological study of the eye and brain of a one-eyed bee. [7] 29: 66-69, ill. **Nielsen, A.**—Das Eierlegen der Laich und die Larven des 1. Stadiums von Oligoplectron maculatum (Trichoptera). [34] 113: 255-266, ill. **Prüffer, J.**—Contribution a la connaissance de l'attraction des males par les femelles chez Lymantria dispar. [Kosmos] 58: 157-173, ill. **Raffy, A.**—Les échanges respiratoires des Lepidoptères. Les échanges pendant le vol. Role des ailes et des organes de la circulation. [Ann. Phys. & Physiochim. Biol., Paris] 12: 1-12. **Roonwal, M. L.**—The growth-changes and structure of the egg of the African migratory locust, Locusta m. migratorioides (Orthop: Acridid.). [22] 27: 1-14, illus. **Sassuchin, D.**—Zur Morphologie und Dynamik der Entwicklung von Nuttalia ninense. [34] 113: 219-226, ill. **Simonetti, V.**—Sul pigmento clorofilloide degli Ortotteri. [Boll. Zool., Turin] 7: 78. **Strelnikov, I. D.**—Effect of the solar radiation and the micro-climate upon the body temperature and behaviour of the larvae of Locusta migratoria [Russian]. [Trav. Inst. Zool. Ac. Sci. USSR] 2: 637-733. **Strohl & Köhler.**—Wesen und Bedeutung der Pleitrope oder Polyphaenie. [Verh. Schweiz. Naturforsch. Ges.] 116: 351-355. **Tate & Vincent.**—The biology of autogenous and anautogenous races of Culex pipiens. (Diptera). [116] 28: 115-145. **Tauber & Yeager.**—On the total hemo-

lymph (blood) cell counts of insects. II. Neuroptera, Coleoptera, Lepidoptera and Hymenoptera. [7] 29: 112-118. **Tulloch, G. S.**—The metasternal glands of the ant, Myrmica rubra, with special reference to the Golgi bodies and the intracellular canaliculi. [7] 29: 81-84, ill. **Uvarov & Hamilton.**—Phase variation and rate of development in the Algerian race of the migratory locust (Locusta migratoria: Orthop: Acridid.). [22] 27: 87-90. **Zurngiebl, L.**—Ueber Missbildungen bei Blattwespen. [Veröff. Deutsch. Kolon. u. Uebersee Mus. Bremen] 1: 199-201, ill.

ARACHNIDA AND MYRIOPODA.—Chamberlin and Ivie.—Nearctic spiders of the genus Wubana. [7] 29: 85-98, ill. (*). **Viets, K.**—Weitere brasilianische Wassermilben aus dem Staate Pernambuco. [34] 113: 203-218 ill. (*). **Roewer, C. F.**—Zwei myrmecophile Spinnen-Arten Brasiliens. [Veröff. Deutsch. Kolon. u. Uebersee Mus. Bremen] 1: 193-196, ill. (*).

THE SMALLER ORDERS OF INSECTS.—Bohart, R. M.—A preliminary study of the genus Stylops in California (Strepsiptera). [55] 12: 9-18, illus. (*). **Buxton, P. A.**—Studies on populations on headlice (Pediculus humanus capitis) [116] 28: 92-97. **da Costa Lima, A.**—Um novo Tisanoptero praga do abacaxi. [O Campo] Aug., 1935: 43, illus. (S). **Fraser, F. C.**—Anax imperator copulating with Cordulegaster boltoni (Odonata). [J. Soc. Brit. Ent.] 1: 117. **Gentil, K.**—Die Entstehung der Schillerfarben bei Chrysopa perla. [17] 53: 173-175, illus. **Jordan, K.**—Some Siphonaptera from South America. [71] 39: 305-310, ill. (*). **Kennedy, C. H.**—Epigomphus crepidus a new Dragonfly from Nayarit, Mexico, with notes on the genus. [7] 29: 126-135, ill. **Kimmins, D. E.**—Synonymic notes on the genera Chloroperla, Isopteryx and Isoperla (Plecoptera). [J. Soc. Brit. Ent.] 1: 121-124, ill. **Mosely, M. E.**—Imaginal Trichoptera apparently feeding. [9] 69: 63. **Pearman, J. V.**—The Taxonomy of the Psocoptera: Preliminary Sketch. [107 B] 5: 58-62.

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SPECIAL NOTICES.—Animalium cavernarum catalogus. Ed. B. Wolf. Pub. by W. Junk., Pars. 1-4. Includes cave insects [See Ent. News XLVI, p. 229].

THE BIOLOGY OF MAYFLIES WITH A SYSTEMATIC ACCOUNT OF NORTH AMERICAN SPECIES, by JAMES G. NEEDHAM, JAY R. TRAVER, YIN-CHI HSU, 1st ed., 8 vo., cloth, 759 pp., 40 plates, 1 color plate, 168 figs. Comstock Publishing Co., Ithaca, N. Y., 1935. $7.50.—The last 25 years have seen a goodly amount of work on the American species of the order Ephemeroptera. Most of it has been of a systematic nature, although there have been a few biological papers. It has been done by relatively few people, most of whom have either ceased their endeavors or now look upon the mayflies as a side-line. Apparently few people have the tenacity to work with a group so difficult to collect, preserve and handle. Throughout this period, Dr. Needham and his students have been faithfully and continuously working with the group, and it is fitting that they should produce the first comprehensive work in mayflies since Eaton's *Revisional Monograph of Recent Ephemeridae or Mayflies* was issued in 1883-87.

The present book consists of two distinct parts: a biological section of 232 pages and a much larger taxonomic section of 527 pages. A more accurate title for the book might have been The Biology and Taxonomy of the Mayflies.

The 18 chapters of the biological section are concerned with (1) historical aspects of research on mayflies in North America, (2) life cycle, (3) anatomy and morphology of nymphs and adults, (4) post-embryonic development, (5) eggs and egg-laying habits, (6) taxonomic characters and their significance,

(7) the mayfly thorax and its musculature, (8) adaptations of the nymphs, (9) phylogeny, (10) parasites and other enemies, (11) values and uses, (12) methods of collecting, preserving and rearing. In reality this section represents the work of 5 people. In addition to those parts written by Drs. Needham and Traver, Dr. Osgood Smith contributed the chapter on eggs and egg-laying habits; Dr. Velma Knox wrote the two chapters dealing with the thorax and thoracic musculature of *Hexagenia recurvata,* and Dr. Hsu contributed 6 chapters on anatomy, morphology, and post-embryonic development, using several species of *Heptageninae.* As is usual when several people contribute to a book, there is great difficulty in achieving a uniform narrative and style. This has been accentuated in the present instance by the fact that Hsu and Knox were working with specific forms, while the others were concerned with the group as a whole.

The sections on taxonomic characters and phylogeny appeal especially to the reviewer, although he does not always agree with the authors. There is a good resumé and discussion of the questions of wing venation and tracheation. The system of names used for venation is a modification of the Comstock-Needham system which the writers feel was in error in locating the median vein and all following veins one triad too far forward in the wing. The triad thus vacated by the median is considered as part of the radial sector. There is now general agreement as to what veins in the wing shall be designated as anals and cubitals. Thus the only debatable point left in mayfly venational nomenclature is that of the name of the triad, which the present authors term the outer fork of the radial sector and which Tillyard and other workers consider to be the anterior median.

Concerning phylogeny, the conclusions reached are that the mayflies are steadily falling behind in their race for survival, and that in their own ways they are specialized far beyond any other group of insects. Needham's theory that the mayflies are not closely related to the Odonata is substantiated by Knox's work on the body wall and musculature of the thorax. She concludes that there is a similarity between the mayflies and certain Neuroptera, the Trichoptera, and the Lepidoptera. It is to be hoped that she will continue her work with other forms such as those of the more generalized genera *Siphlonurus* and *Isonychia.*

The taxonomic section, which makes up two-thirds of the book, is primarily the work of Dr. Traver. The order, so far as extant forms are concerned, is divided into 3 families and 17 subfamilies. Geographically North America north of Mexico has been included in this section. Of the 17 subfamilies

only 3 have not at the time of the writing of this book been recorded from this area. Only one subfamily is unique to North America. Forty-seven genera and 507 species are recognized, of which 48 are new. It is interesting to note that in 1907 Banks listed 102 species in his *Catalogue of Neuropteroid Insects*.

Keys are given for families, subfamilies, genera and species. Wherever sufficient information has been available, keys are given for both nymphs and adults. As is to be expected, considerably more is known about the adults than about the immature stages.

Detailed verification tables for the various categories are given and also a complete synonomy for each genus and species. The descriptions of new and redescriptions of old species are well drawn and complete. If any criticisms are to be levelled at this section, they are of omission rather than of commission. One receives the impression that the nymphs have been neglected, especially in the description of the species. Although the type locality is given for new species, it is not included for the old. For each species there is given a list of localities from which specimens have been seen, and the collector's name, but *without* the date of collection. This is a serious omission. Consider the fact that many species have two broods or more per year, that the number of broods probably varies from north to south, that some species emerge in "waves," that some spread out their emergence period over several weeks or months (so far as we know), and that some emerge during only a few days each year, and it can be readily understood why future workers, in trying to untangle complex distributional and taxonomic puzzles, will sorely need the collection dates. Since mayflies live only a couple of days at best, the date of collection also gives the investigator the emergence date.

These criticisms, however, do not detract seriously from the enormous value of the book. Here for the first time the names, descriptions and known distribution of all North American species, along with a clear delineation of the genera, have been brought together into one volume. Anyone that has ever tried to identify mayfly species will fully comprehend the value and worth of such an undertaking. It is also patent that an almost incredible amount of toil and pains has gone into its preparation.

The book is well illustrated with a color plate frontispiece, the pictures of H. A. Hagen, B. D. Walsh, Thomas Say, A. E. Eaton, and A. Vayssiere, 40 text plates and 168 text figures. There is also a complete index and bibliography.—HERMAN T. SPIETH.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

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Wanted—Tabanidae (Horseflies and Deerflies). Exchange, purchase, or for determination. G. B. Fairchild, P. O. Box 272, Monticello, Fla.

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